

COMMONWEALTH OF AUSTRALIA

THE PATENTS ACT 1952-1973

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of the Application 87665/82 made by COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION (CSIRO) and RESERVE BANK OF AUSTRALIA (RBA) for a patent for an invention entitled "IMPROVED BANK NOTES AND THE LIKE".

I, ALFRED PERNAT, of SIROTECH LIMITED, 9 Queens Road, Melbourne, Australia, do solemnly and sincerely declare that I am authorised by CSIRO to make this declaration on its behalf, and

I, Malcolm Robert HILL of RBA, Martin Place, Sydney, New South Wales, do solemnly declare that I am authorised by RBA to make this declaration on its behalf.

David Henry SOLOMON of 31 Brazilia Drive, Glen Waverley, Mario GIROLAMO of 50 Alpha Road, North Balwyn, John Bentley ROSS of 6 Wandeen Road, Glen Iris and Robert Alan BRETT of 32 McLaren Street, Mount Waverley, all in the State of Victoria are the actual inventors of the invention and the facts upon which the application is entitled to make the application are as follows:-

- (i) The actual inventors are officers of CSIRO and the invention was made in the course of their official duties with CSIRO; CSIRO is therefore entitled to apply by virtue of Section 54 (i) of the Science and Industry Research Act 1949.
- (ii) RBA is an assignee of an equal share of rights in the invention from CSIRO.

Declared at MELBOURNE this 17th day of September 1986

A Pernat

Declared at Sydney this 10th day of October 1986

M McE

Secretary
Reserve Bank of Australia

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- (74) DC
(56) US 4298217
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GB 1562248

(57) Claim

1 A bank note or other security token comprising a flexible film substrate bearing printed or other identifying indicia and at least one optically variable security marking or device, wherein the substrate is a composite made up of at least one bi-axially-oriented polymeric film with a heat activated adhesive coating on at least one side, said substrate, indicia and the security marking or device being covered with a transparent protective layer of polymeric material intimately heat-bonded to the substrate.

6 A method of producing a bank note or like security token comprising the basic steps of forming a composite, transparent polymeric substrate by heat laminating at least two films of adhesive-coated, bi-axially-oriented polymer material together and by coating at least one surface of the composite sheet so formed with an opacifying layer, said opacifying layer comprising a major proportion of one or more pigmentary materials bound with a minor proportion of a heat-activated cross-linkable polymeric

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binder, printing indicia on said opacifying layer, hot stamping at least one optically variable device onto the substrate (either before or after printing) and then coating both sides of the printed substrate with a transparent protective layer of polymeric material.

8. Apparatus for use in producing bank notes and other security tokens as defined in claim 1, comprising:

means for feeding at least two biaxially-oriented polymeric films through a pair of heated calender rolls so as to form them into an intimately bonded flexible film substrate in which at least one outer surface is covered with an adhesive coating;

means for heating the said substrate, if necessary, to accept printing or other identifying indicia;

means for feeding the said substrate through printing rolls which apply an opacifying coating to at least part of one or both sides of the said substrate;

means for applying printed or other identifying indicia to said opacifying coating;

means for feeding said substrate through the nip of a pair of rollers;

means for feeding a transfer foil having a thin coating of optically-variable material thereon through said nip together with said substrate so that said thin coating is adjacent to the substrate; raised pads on the surface of one of said pair of rollers adapted to be heated so that, when one of said pads is brought into contact with said foil (or with the substrate) a portion of the thin coating is transferred to the substrate;

detecting means adapted to sense the position of

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the substrate and to delay or advance the rotation of the one of said pair of rollers so as to position said pads (and said portion of the coating) so that said pads press upon predetermined areas of the substrate to transfer said portion of the coating thereto; and means for applying a thin protective coating of transparent polymeric material to both outer surfaces of the substrate.

PCT

AU-A 87665/82
 WORLD INTELLECTUAL PROPERTY ORGANIZATION
 International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/AU82/00135		(74) Agents: DUNCAN, Alan, David et al.; Davies & Col- lison, AMP Building, Hobart Place, Canberra, A.C.T. 2601 (AU).	
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		This document contains the amendments made under Section 49.	
(54) Title: IMPROVED BANKNOTES AND THE LIKE			
<div style="text-align: right;"> and is correct for printing 1 1 </div>			
(57) Abstract			
<p>A security token, such as a bank note or identity card, which is durable and difficult to forge. The token comprises a sheet-like substrate made up from a film of transparent bi-axially oriented polymer coated with layers of opaque and heat-activated adhesive material. The opaque layer is applied in such a way as to leave a transparent area for inspection of a security device, e.g. a diffraction grating, incorporated in the polymer film. The substrate may bear printed or other identifying indicia and is protected with an intimately bonded layer of transparent polymeric material.</p>			

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TITLE:'IMPROVED BANKNOTES AND THE LIKE'TECHNICAL FIELD

5 This invention relates to the design, construction and production of paper-like "security tokens" such as bank-notes, travellers cheques, share script, personal identification papers and the like. It seeks to provide a durable token of high security, that is, one which is most difficult to forge

10 BACKGROUND ART

15 In our prior Australian Patent No.488,652, a novel approach to the production of security tokens - particularly bank-notes - was disclosed and the serious problems which confront conventional bank notes with respect to forgery were described. The security token or bank-note disclosed in Patent No.488,652 comprised a substrate of opaque thermoplastic sheet material intimately bonded to a web of woven or unwoven thermoplastic fibres, the substrate being printed as desired and having bonded thereon one or more
20 optically-variable security devices. The fibrous web was employed to impart durability, crumple-resistance and

difficulty of simulating optically-variable devices by photo-engraving techniques.

5 Note: In this specification, the term "optically variable" means having an appearance which changes reversibly with a change in viewing conditions, for example, with change in viewing angle or with change in temperature or pressure.

10 Accordingly, the bank-note (or other security token) of the present invention comprises a flexible film substrate bearing printed or other identifying indicia and at least one optically-variable security marking or device, wherein the substrate is a composite made up of at least one bi-axially-oriented polymeric film with a heat-activated adhesive coating on at least one side, said substrate, indicia and optically variable security marking
15 or device being covered with a transparent protective layer of polymeric material intimately bonded to the substrate.

20 The substrate may comprise a laminate of two or more layers of transparent bi-axially-oriented polymer film, each of which is coated on both sides with a heat activated adhesive layer. Alternatively, the substrate could be a suitable single-layer film should such become available in commercial quantities. Preferably, this substrate is coated on both sides with an opacifying pigmentary coating, comprising a major portion of pigment in a minor proportion of a cross-linked polymeric binder,



variable device in position on the composite substrate, to print both sides of the substrate and to cover both sides with a transparent protective layer, all the components of the bank-note or other security token thus formed being
5 intimately bonded together. (It is possible, of course, to apply the device before or after printing).

It will be appreciated that some notes or tokens of low nominal value may need not to include an optically variable device. Such notes are also intended to be within the scope
10 of the present invention, however, the use of optically variable devices is preferred - as is their application on the note within transparent areas to allow them to be viewed from either side of the note and to allow
optical-transmission effects - such as Moire gratings - to
15 be employed. Optically variable devices comprising Moire patterns and diffraction gratings were described in our above-mentioned prior Australian patent.

The invention also comprises a method of producing a bank-note or the like security token comprising the basic
20 steps of forming a composite, transparent, polymeric substrate by heat-laminating at least two films of adhesive-coated, bi-axially-oriented polymer material together and by coating at least one surface of the composite sheet with an opacifying treatment including a
25 major proportion of one or more pigmentary materials bound with a minor proportion of a heat-activated cross-linkable



polymeric binder, passing said substrate through a printing machine to print indicia on said opacifying coating, hotstamping at least one optically variable device onto the substrate (either before or after printing, but preferably
5 after) and then coating both sides of the printed substrate with a transparent protective layer of polymer material.

In order to minimise the discontinuity associated with the inclusion of a security device within the bank-note or the like token, the substrate is typically between 60 and 80
10 microns thick, while the optically variable security devices may be between 2 and 8 microns thick. Such devices may be formed in accordance with our co-pending patent Australian
Patent Application/^{No: 87664/82}~~No. PF0384 and PF0386~~. To handle such devices, it is necessary that they be carried on a transfer
15 foil, it being preferred in accordance with the present invention, to transfer these devices from the foil onto the substrate by a hot-stamping process. Also, it will be clear from the aforementioned co-pending patent application that
the security devices need not be formed as discrete entities
20 on the transfer foil but may, with advantage, be formed as a continuous optically variable coating on the foil, portions of which may be transferred onto the substrate at predetermined locations thereon.

Accordingly, the invention also includes apparatus for
25 producing bank-notes and the like security tokens comprising:



means for feeding at least two
biaxially-oriented polymeric films through a
pair of heated calender rolls so as to form them
5 into an intimately bonded flexible film
substrate in which at least one outer surface is
covered with an adhesive coating;
means for heating the said substrate, if
necessary, to accept printed or other
10 identifying indicia;
means for feeding the said substrate through
printing rolls which apply an opacifying coating
to at least part of one or both sides of the
said substrate;
15 means for applying printed or other identifying
indicia to said opacifying coating;
means for feeding said substrate through the nip
of a pair of rollers;
means for feeding a transfer foil having a thin
20 coating of optically-variable material thereon
through said nip together with said substrate so
that said thin coating is adjacent to the
substrate; raised pads on the surface of one of
said pair of rollers adapted to be heated so
25 that, when one of said pads is brought into
contact with said foil (or with the substrate) a
portion of the thin coating is transferred to
the substrate;
detecting means adapted to sense the position of
30 the substrate and to delay or advance the
rotation of the one of said pair of rollers so
as to position said pads (and said portion of
the coating) so that said pads press upon
predetermined areas of the substrate to transfer
35 said portion of the coating thereto; and



means for applying a thin protective coating of transparent polymeric material to both outer surfaces of the substrate.

5 In order to further portray the nature of the present invention, a particular embodiment thereof will now be described by way of example and illustration only. In the following description reference will be made to the accompanying drawings.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a diagrammatic representation of a laminating coating and drying process and apparatus suitable for the production of a bank-note substrate.



Figure 2 is a diagrammatic representation of apparatus for transferring optically variable devices from a transfer foil onto the substrate of the particular embodiment.

Figure 3 is a detailed cross-sectional diagram showing the substrate and the transfer foil of Figure 2 in more detail.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

The particular embodiment of this invention concerns the production of bank-notes of high durability and security but which can be readily mass-produced. The bank-note of this particular embodiment is to have the appearance and feel of a conventional paper bank-note except that it includes a transparent portion or window within which an optically variable device such as a Moire grating or a diffraction grating is incorporated. In spite of the incorporation of this device, however, the note - at least superficially - is to appear to be of uniform thickness, to have no discontinuities, stiff inserts or the like. As previously indicated, the note basically comprises a transparent substrate having a pigmented coating, leaving the window onto the surface of which a very thin flexible optically variable device is hot-stamped. The entire note is then covered on each side with a thin, transparent protective polymeric coating adapted to resist dirt, grease and common solvents and to protect the exposed surface of the window and the exposed surface of the optically variable device.

Referring now particularly to Figure 1 of the accompanying drawings, the production of the basic substrate material as a continuous strip or web is shown diagrammatically. The substrate illustrated consists basically of a laminate of three 24 micron sheets, 10, 12 and 14 of polymeric film on each side of which a thin coating of heat-activated polyolefin has been deposited. The three sheets are led together through a pair of heated callender rolls 16 so as to form them into an intimately bonded laminate 18. This laminate is led through a double set of printing rolls 20 which apply a uniform coating of a pale-coloured printing ink onto both surfaces of the laminate 18 to form the substrate 24, which is led through a drying oven 22 within which the coating is dried and cured.

15 Preferably, prior to the coating step, the laminate 18 is subjected to known surface treatment to improve the adhesion of the opacifying ink thereto. A suitable treatment may be the use of corona discharge, this being illustrated diagrammatically at 25 in Figure 1. The treated

20 laminate is coated with a pigmented coating comprising a pigment such as titanium dioxide dispersed within a binder or carrier of heat-activated cross-linkable polymeric material. In the coating of the substrate at station 20, a transparent window is left at intervals corresponding to

25 each note within which the security device will be later inserted.

After the substrate has been produced as described in respect to Figure 1, it is printed by the high quality presses normally employed in the production of bank-notes. Where sheet fed presses are employed, the substrate web may
5 be cut into sheets for feeding, otherwise it can be fed directly into web fed presses.

After printing, the web or sheets are fed through an apparatus manufactured in accordance with the present invention wherein the optically variable devices are
10 hot-stamped onto the window portion of the partially completed bank-notes. In this particular embodiment, the printed sheets or web 24 are fed between the nip of a pair of rollers 26 and 28 together with (and at the same speed as) a transfer foil 30. It would be usual for the sheet or
15 web 24 to have a plurality of bank-notes printed across its width but, in that case, it can be readily arranged for the transparent windows of the notes in each row to be precisely aligned transversely across the sheet or web. Thus, a separate transfer foil 30 is provided for each note across
20 the width of the sheet.

In accordance with the invention, upper roll 26 bears on its surface a series of raised pads 29 in line with each transfer foil 30, the pads 29 being spaced apart by a linear distance corresponding exactly with the longitudinal
25 interval between the windows of the printed notes on sheet 24. Either the entire upper roll 26 or the individual



raised pads 29 are heated so that as they rotate, they press the transfer foil firmly against the sheets 24 to effect the transfer of an optically variable device from the surface of the foil onto the sheet. Details of the transfer foil are provided in our above-mentioned co-pending application, but Figure 3 provides illustration of this. In this example, the optically variable device 32 consists of a 3 to 5 micron layer of a soft thermoplastic material such as an acrylic copolymer into the surface of which a diffraction grating has been impressed and onto which surface a thin coating (less than 1 micron) of aluminium has been deposited to form the reflective diffraction grating. On this metallised surface, a further layer of an acrylic copolymer has been deposited as a heat-activated transfer medium which will facilitate the transfer and adhesion of the thin composite foil from the carrier and onto the substrate. To facilitate this transfer, the roller 28 is preferably cooled.

While transverse alignment of the notes printed on sheet 24 can be achieved by appropriate guides and accurate trimming of the sheets, longitudinal registration of the transfer devices within the window requires adjustment to compensate for stretch in a continuous web or slight variations in the pickup of separate sheets. For this purpose, in accordance with the present invention, a detector 34 is provided to detect a series of registration marks printed or otherwise formed on the edge of sheet 24.

these marks bearing a constant positional relationship with the transparent windows of the printed notes. The output from detector 34 is transmitted to a comparator/controller 36 into which a signal is fed from a shaft-position encoder 38 connected to the shaft of roller 26, the comparator being adapted to produce a signal to indicate the degree of alignment or misalignment between pads 29 and the windows of the notes. This signal from the comparator can then be deployed to drive motor 40 to adjust the angular position of the roller 26 appropriately to maintain the desired alignment.

Finally, the printed note in sheet or roll form, bearing the optically variable devices, are then subjected to a further calendering or coating process (not illustrated) in which a thin coating of protective and transparent polymeric material is applied to both surfaces of the sheets, this coating serving the combined purpose of providing a soil and solvent resistant outer skin and of bonding the optically variable devices firmly in place and protecting their surfaces from mechanical damage. After this final coating operation, the completed bank-notes are separated by guillotining in the conventional fashion.

INDUSTRIAL APPLICABILITY

It will be appreciated by those skilled in the art that a durable, and secure bank-note, capable of mass production at economical cost by note issue authorities may be produced



by the apparatus and process described in the particular embodiment given. However, many variations and modifications can be made to the system as described without departing from the scope of the present invention.



CLAIMS

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1 A bank note or other security token comprising a flexible film substrate bearing printed or other identifying indicia and at least one optically variable security marking or device, wherein the substrate is a composite made up of at least one bi-axially-oriented polymeric film with a heat activated adhesive coating on at least one side, said substrate, indicia and the security marking or device being covered with a transparent protective layer of polymeric material intimately heat-bonded to the substrate.

2 A bank note or the like according to claim 1, further characterised in that the said substrate comprises a laminate of two or more layers of transparent bi-axially-oriented polymer film each of which is coated on each side with a heat-activated adhesive layer.

3 A bank note or the like according to claim 1 or claim 2, further characterised in that an opacifying coating is applied to both sides of the substrate before said transparent protective layer is applied, said opacifying coating comprising a major proportion of pigment and a minor proportion of a cross-linked polymeric binder.

4 A bank note or the like as defined in claim 3, wherein the opacifying coating is applied so as to leave an area of the substrate uncoated and transparent.

5 A bank note or the like according to claim 4, characterised in that the security marking or device is hot-stamped to the substrate in said transparent area.

6 A method of producing a bank note or like security token comprising the basic steps of forming a composite, transparent polymeric substrate by heat laminating at least two films of adhesive-coated, bi-axially-oriented polymer material together and by coating at least one surface of the composite sheet so formed with an opacifying layer, said opacifying layer comprising a major proportion of one or more pigmentary materials bound with a minor proportion of a heat-activated cross-linkable polymeric binder, printing indicia on said opacifying layer, hot stamping at least one optically variable device onto the substrate (either before or after printing) and then coating both sides of the printed substrate with a transparent protective layer of polymeric material.

7 A method according to claim 6 characterised in that said at least one optically variable device is conveyed into position over the substrate by and on a transfer foil and transferred from the foil onto the substrate by hot-stamping, the opacifying layer being applied to leave an uncoated and transparent area on the substrate and said at least one optically variable device being applied by hot-stamping onto that area.



8. Apparatus for use in producing bank notes and other security tokens as defined in claim 1, comprising:

means for feeding at least two biaxially-oriented polymeric films through a pair of heated calender rolls so as to form them into an intimately bonded flexible film substrate in which at least one outer surface is covered with an adhesive coating;

means for heating the said substrate, if necessary, to accept printing or other identifying indicia;

means for feeding the said substrate through printing rolls which apply an opacifying coating to at least part of one or both sides of the said substrate;

means for applying printed or other identifying indicia to said opacifying coating;

means for feeding said substrate through the nip of a pair of rollers;

means for feeding a transfer foil having a thin coating of optically-variable material thereon through said nip together with said substrate so that said thin coating is adjacent to the substrate; raised pads on the surface of one of said pair of rollers adapted to be heated so that, when one of said pads is brought into contact with said foil (or with the substrate) a portion of the thin coating is transferred to the substrate;

detecting means adapted to sense the position of the substrate and to delay or advance the rotation of the one of said pair of rollers so as to position said pads (and said portion of



the coating) so that said pads press upon predetermined areas of the substrate to transfer said portion of the coating thereto; and means for applying a thin protective coating of transparent polymeric material to both outer surfaces of the substrate.

9. A bank note or other security token substantially as hereinbefore described with respect to the accompanying drawings.

10. A method of producing a bank note or other security token substantially as hereinbefore described with reference to the accompanying drawings.

11. Apparatus for use in manufacturing bank notes or other security tokens substantially as hereinbefore described with reference to the accompanying drawings.

DATED THIS THIRD DAY OF NOVEMBER , 1986

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION

and

THE RESERVE BANK OF AUSTRALIA

By their Patent Attorneys
DAVIES & COLLISON



DRAWINGS

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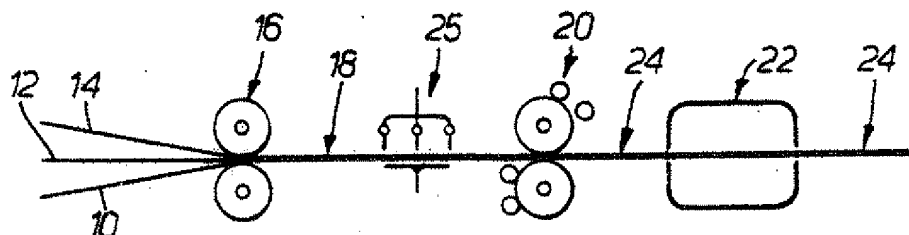


FIG. 1.

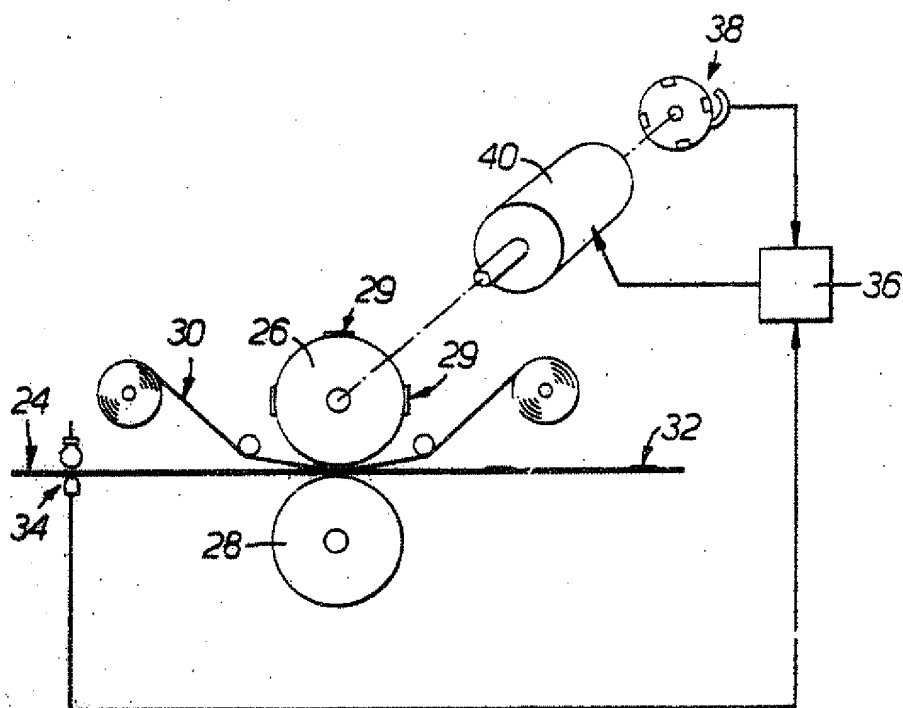


FIG. 2.

SUBSTITUTE SHEET



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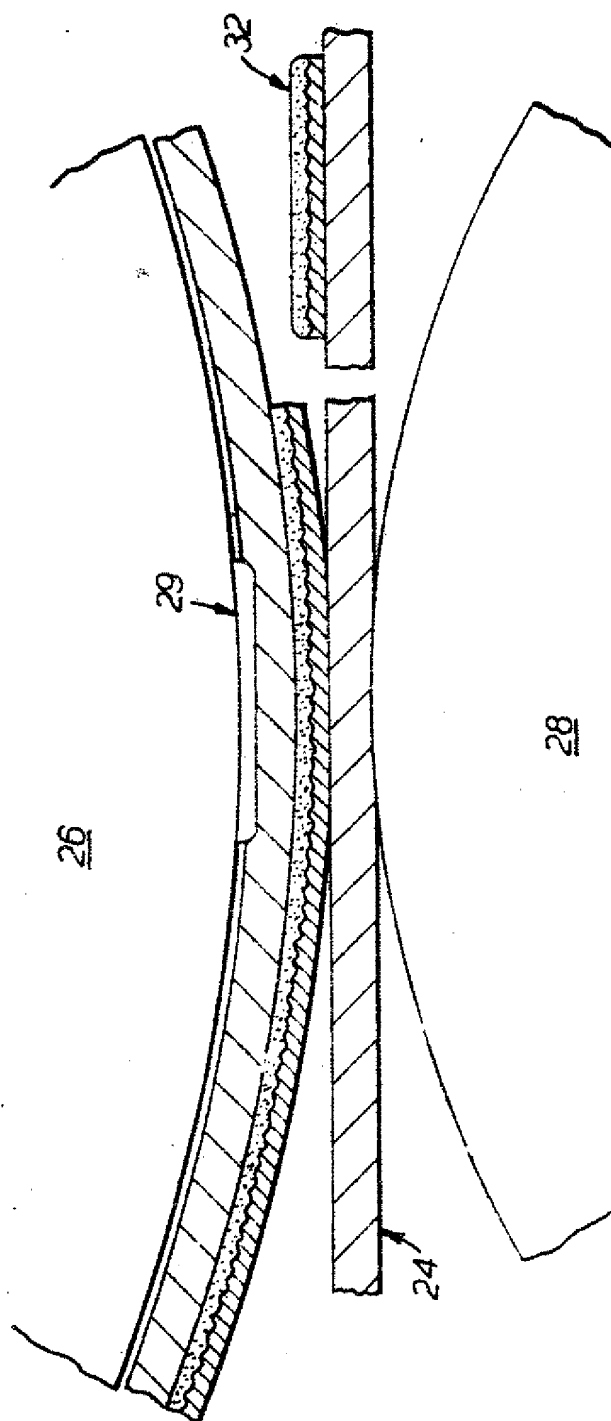


FIG. 3.

SUBSTITUTE SHEET



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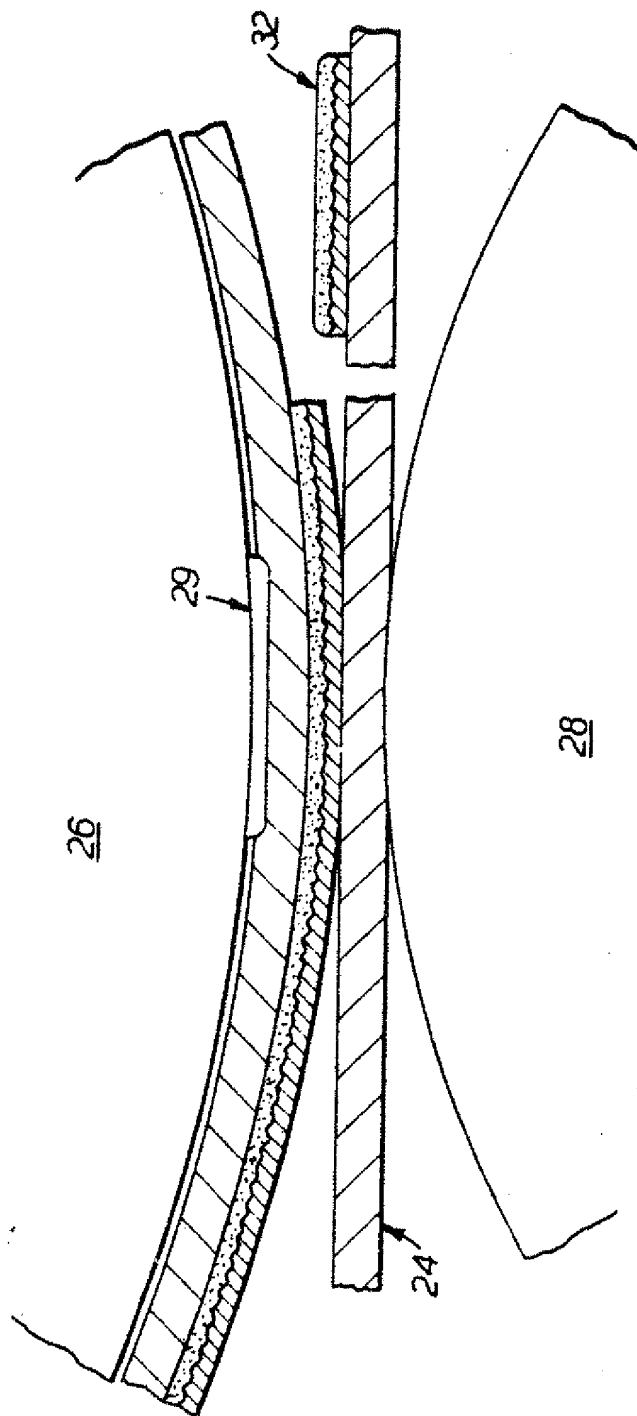


FIG. 3.

24 29 32

SUBSTITUTE SHEET



INT.

SEARCH

REPORT

INTERNATIONAL SEARCH REPORT

International Application No. PCT/AU 82/00135

I. CLASSIFICATION OF SUBJECT MATTER (of several classification symbols apply, indicate all)
According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl. B42D 15/00 B44F 1/12, B32D 7/12, 33/00

II. FIELDS SEARCHED

Minimum Documentation Sought

Classification Symbols

Classification System

IPC

B42D 15/00; B44F 1/12; B32D 7/12, 33/00

Documentation Sought other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched

AU: IPC as above. Australian Classification AB.7

III. DOCUMENTS CONSIDERED TO BE RELEVANT

Citation of Document, with indication, where appropriate, of the relevant passages of

Relevant to Claim No. 1

- A. JP, A, 5198729 (NISHIKAWA) 3 August 1978 (03.08.78)
(JAPATIC ABSTRACT 1978 M 78)
- A. US, A, 4298217 (MORAW, WALTER) 3 November 1981 (03.11.81)
- A. US, A, 3204354 (BERGER) 7 September 1965 (07.09.65)
- A. GB, A, 1562248 (LEE) 5 March 1980 (5.03.80)
- A. GB, A, 1561445 (HOOKER) 29 February 1980 (20.02.80)
- A. GB, A, 1433367 (KLASSEN) 28 April 1976 (28.04.76)
- A. GB, A, 1371254 (KILMER, LAURER) 23 October 1974 (23.10.74)
- A. GB, A, 1427581 (G.A.G) 10 March 1978 (10.03.78)

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
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- "P" document published prior to the international filing date but later than the priority date claimed

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- "Y" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- "Z" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "A" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search:
28 October, 1982 (28.10.82)

International Searching Authority:

AUSTRALIAN PATENT OFFICE

Form PCT/ISA/210 (second sheet) (October 1981)

Date of Mailing of this International Search Report:

08 November 1982

Signature of Authorized Officer:

R.E.W. MAY

(08.11.82)

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